

REMARKS

Claims 1 through 4, 6, 7, 9 through 15 and 20 through 27 are pending in the application, with Claims 9 through 15 and 20 through 27 having been withdrawn, Claims 5, 8 and 16 through 19 having been cancelled, and Claims 1 through 4, 6, 7 and 16 through 19 having been amended. Of the pending non-withdrawn claims, Claims 1 and 6 are independent. No new matter has been added. Reconsideration and further examination are respectfully requested.

Claim objections

Claims 2 through 4, 6, and 7 have been amended to address the informalities noted in the Office Action. Claims 5, 8 and 17 through 19 have been cancelled so the objection thereto is deemed moot. Withdrawal of the objections to the claims is therefore respectfully requested.

Restriction requirement

The pending claims are subject to a restriction requirement. In particular, the Office Action groups the claims into Claims 1 through 8 and 16 through 19 (Group I), Claims 12 through 15 and 24 through 27 (Group II), and Claims 9 through 11 and 20 through 23 (Group III). Election of one of these Groups is required because the Groups are alleged to be distinct.

In response to the restriction requirement, Applicant confirms affirm the election of Group I, Claims 1 through 8 and 16 through 19. Examination and allowance of the elected claims are respectfully requested.

This election is made with traverse. Applicant requests reconsideration of the restriction requirement in light of the following arguments, and pursuant to 37 CFR §1.143. As grounds for traversal, Applicant believes that Groups I and II are not distinct from one another.

The Office Action correctly indicates that Group I and Group II represent a subcombination and a combination as described in MPEP §806.05(c)II. The Office Action further indicates that the groups are distinct because 1) the combination does not require the particulars of the subcombination for patentability and 2) the subcombination has utility by itself or in other combinations. In support of the first prong, the Office Action states “the combination as claimed does not require particulars of the subcombination as claimed because second

microvia pad for the system can be any type pad and particularly without projection as claimed for a apparatus (*sic*)”.

The above statement is not seen to establish that the combination (i.e., Group II) does not require particulars of the subcombination (i.e. Group I) for patentability. Rather, the separately claimed subcombination of Group I “constitutes the essential distinguishing feature of the combination” (see §806.05(c)II) of Group II. In other words, patentability of the Group II combination depends entirely on the elements claimed in Group I. Restriction therefore “must not be made” (§806.05(c)II) between Group I and Group II.

Applicant respectfully requests withdrawal of the restriction requirement with respect to Groups I and II and examination of Claims 12 through 15 and 24 through 27 on the merits.

Claim rejections

Claims 1, 3 through 5, 7 and 8 are rejected under 35 U.S.C. §102 as allegedly being anticipated by U.S. Patent No. 6,093,630 (“Geffken”); Claims 16 through 19 are rejected under 35 U.S.C. §102 as allegedly being anticipated by U.S. Patent Publication No. 2005/0016768 (“Zollo”) in view of U.S. Patent No. 6,294,745 (“Gruber”); and Claims 2 and 6 are rejected under 35 U.S.C. §102 as allegedly being obvious over Geffken in view of U.S. Patent No. 6,093,643 (“Akram”). Reconsideration and withdrawal of the rejections are respectfully requested.

Claim 1

Amended independent Claim 1 concerns an integrated circuit package comprising a first metallization layer, a second metallization layer, and an intermediate layer disposed between the first metallization layer and the second metallization layer. The first metallization layer comprises a first microvia pad, and the second metallization layer comprises a second microvia pad having a projection extending in a direction toward the first microvia pad. The intermediate layer includes a microvia electrically coupled to the first microvia pad and to the second microvia pad. As described in the present specification, the features of amended independent Claim 1 may provide a structure that is more resistant to delaminating and/or cracking than conventional structures.

The art of record is not seen to disclose or to suggest the foregoing features of amended independent Claim 1. The art of record, in particular, is not seen to disclose or to suggest at least a first metallization layer comprising a first microvia pad, a second metallization layer comprising a second microvia pad having a projection extending in a direction toward the first microvia pad, and an intermediate layer including a microvia electrically coupled to the first microvia pad and to the second microvia pad.

Geffken describes semiconductor device 100 to support solder bumps. Device 100 includes landing wire 104, via 124, and transition layer 160 on which solder bump 170 may be deposited. In this regard, Geffken describes a conventional system in which via 120 is a homogeneous solid for coupling conductive elements across device layers.

The Office Action cites landing wire 104 and via 124 as allegedly disclosing the claimed second microvia pad and projection, respectively. Even if such an interpretation were permissible, which is not conceded, Geffken would fail to disclose or to suggest a microvia coupled to the second microvia pad. Applicant notes that, contrary to M.P.E.P §2131, the Office Action does not specify any element of Geffken that allegedly corresponds to the microvia of Claim 1.

Therefore, Geffken cannot be seen to disclose or to suggest a microvia if landing wire 104 and via 124 are taken to represent the claimed second microvia pad and projection. Moreover, if landing wire 104 is indicated to represent the claimed second microvia pad and via 124 is indicated to represent the claimed microvia, Geffken would fail to disclose or to suggest the claimed projection of the second microvia pad extending in a direction toward a first microvia pad.

Accordingly, Geffken cannot be seen to disclose or to suggest a first metallization layer comprising a first microvia pad, a second metallization layer comprising a second microvia pad having a projection extending in a direction toward the first microvia pad, and an intermediate layer including a microvia electrically coupled to the first microvia pad and to the second microvia pad. The remaining references have been reviewed and are not seen to include any disclosure to remedy the foregoing deficiencies of Claim 1. Claim 1 is therefore believed to be allowable.

Claims 2, 3 and 4 depend from Claim 1 and are believed to be allowable for at least the foregoing reasons. In this regard, Applicant respectfully disagrees with the characterization of “electroless” in Claim 4 as a “process limitation”. According to M.P.E.P §2173.05(p), a product-by-process claim defines a claimed product in terms of the process by which it is made. The term “electroless” is not used to define the apparatus of Claim 4 by the process by which it is made, but rather describes a physical property of the conductor recited in Claim 4. “Electroless” is therefore a descriptive term that is no different in usage than “metal”, “wood”, “purple”, “spherical”, and that must be fully considered in determining the patentability of Claim 4.

Claim 6

Amended independent Claim 6 relates to an integrated circuit package including a first metallization layer, a second metallization layer, and an intermediate layer disposed between the first metallization layer and the second metallization layer. The first metallization layer includes a first microvia pad. The second metallization layer includes a second microvia pad, and the intermediate layer includes a microvia electrically coupled to the first microvia pad and to the second microvia pad. The microvia includes a plurality of surfaces facing respective ones of a plurality of surfaces of the second microvia pad.

The art of record is not seen to disclose or to suggest the foregoing features of amended independent Claim 6. The art of record, in particular, is not seen to disclose or to suggest at least a first metallization layer comprising a microvia electrically coupled to a first microvia pad and to a second microvia pad, wherein the microvia includes a plurality of surfaces facing respective ones of a plurality of surfaces of the second microvia pad.

Again, Geffken is seen to describe a conventional system in which via 120 is a homogeneous solid for coupling conductive elements (e.g., landing wire 104, transition layer 160) across device layers. As conceded in the Office Action, Geffken does not teach a microvia includes a plurality of surfaces facing respective ones of a plurality of surfaces of the second microvia pad. Akram is cited to allegedly remedy this deficiency in Geffken.

Akram describes an electrical interconnect that may be fabricated using semiconductor-based fabrication techniques and that may be used to receive a discrete electrical component.

FIG. 7 of Akram shows bulk silicon substrate 12 which is covered by insulating layer 13, electrically isolated conductive cap 34, and conductive trace 44. Substrate 12 includes apexes 16, 18, 20 and 22 that are covered as described above by insulating layer 13.

Insulating layer 13 electrically insulates substrate 12 and apexes 16, 18, 20 and 22 from conductive cap 34 and conductive trace 44. Therefore, nowhere can Akram be seen to disclose or to suggest a microvia electrically coupled to a microvia pad of a metallization layer as claimed in Claim 6. The only electrical coupling shown in Akram is the direct (i.e., not requiring a microvia) connection between conductive cap 34 and conductive trace 44.

Since Akram cannot be seen to disclose or suggest any microvia, Akram cannot be seen to disclose or suggest any microvia including a plurality of surfaces facing respective ones of a plurality of surfaces of a second microvia pad. The art of record, alone or in any permissible combination, can therefore not be seen to disclose or to suggest the features of amended independent Claim 6. Claim 6 is therefore believed to be in condition for allowance.

Claim 7 depends from Claim 6 and is believed to be allowable for at least the foregoing reasons. Claim 7 is believed to be additionally patentable by virtue of its recitation of an electroless conductor disposed between the microvia and the second microvia pad, wherein the second microvia pad and the microvia are composed of an electrolytic conductor. As described above, the term "electroless" is believed to be entitled to full consideration as a descriptive term in determining the patentability of Claim 7.


CONCLUSION

The outstanding Office Action presents a number of characterizations regarding each of the applied references, some of which are not directly addressed herein because they are not related to the rejections of the independent claims. Applicant does not necessarily agree with the characterizations and reserve the right to further discuss those characterizations.

For at least the reasons given above, it is submitted that the entire application is in condition for allowance and such action is respectfully requested at the Examiner's earliest convenience. Alternatively, if there remains any question regarding the present application or any of the cited references, or if the Examiner has any further suggestions for expediting allowance of the present application, the Examiner is cordially requested to contact the undersigned via telephone at (203) 972-0049.

Respectfully submitted,

January 17, 2006
Date


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